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The Miles equation has long been used to predict slosh damping in liquid propellant tanks due to ring baffles. The original work by Miles identifies defined limits to its range of application. Recent evaluations of the Space Launch System identified that the Core Stage baffle designs resulted in violating the limits of the application of the Miles equation. This paper describes the work conducted by NASA/MSFC to develop methods to predict slosh damping from ring baffles for conditions for which Miles equation is not applicable. For asymptotically small slosh amplitudes or conversely large baffle widths, an asymptotic expression for slosh damping was developed and calibrated using historical experimental sub-scale slosh damping data. For the parameter space that lies between region of applicability of the asymptotic expression and the Miles equation, Computational Fluid Dynamics simulations of slosh damping were used to develop an expression for slosh damping. The combined multi-regime slosh prediction methodology is shown to be smooth at regime boundaries and consistent with both sub-scale experimental slosh damping data and the results of validated Computational Fluid Dynamics predictions of slosh damping due to ring baffles.

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